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Decontamination: Keeping Personnel Safe

When hazardous materials are present, contamination of emergency personnel is a real possibility. Here are some tips on how to prevent or reduce the danger, and some ways to deal with contamination when it does occur.

Contamination is a word that strikes fear. Contaminated water. Contaminated food. Contaminated air. Anytime *contamination* precedes a word, it implies unclean. Further, the inference is that the material creating the contamination is toxic, with an undetermined lethality. The desire to remove such toxic pollution finds expression in another word: *decontamination*.

As we all know, the firefighter's world is not a sanitary one. Soot and ashes on our hands, face, and gear are the inevitable byproducts of the firefighting process. As a matter of fact, "getting dirty" is almost a necessity if you want to maintain the firefighter image. Under certain firefighting situations, however, the contamination of a firefighter's hands, skin, and protective gear cannot only jeopardize his health but also endanger the lives of other people far removed from the fireground. Those situations to which I refer involve hazardous materials.

Take, for example, an incident that occurred in Castaic, California. The interstate highway that runs through this rather remote area is a corridor for the transportation of hazardous materials. An aluminum-shell tanker containing a hazardous material suddenly developed a rather severe leak. The chemical was etching its way through the aluminum shell.

The product that subsequently poured onto the highway was highly corrosive. Law enforcement officials and firefighters attempting to control the emergency got the chemical on their skins and clothing. In a short while, a number of response personnel were beginning to experience toxic reactions. And they were not the only ones to suffer from the contamination. Ambulance drivers brought to the scene to transport the injured firefighters and police officers were contaminated also and began to suffer adverse effects of exposure.

Hospital emergency room personnel receiving the combined casualties of the incident were not prepared to deal with such contamination. Nurses, doctors, and emergency room personnel received secondary contamination and suffered adverse effects also.

Like a chain reaction, those who were contaminated in turn contaminated those who tried to help them. That a hazardous materials incident in your area could trigger such a series of contaminations is not remotely possible, it is highly probable.



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Firefighters, police officers, and emergency medical personnel should be cognizant of the conditions that lead to contamination during hazardous materials incidents. They should all be familiar with the measures that can be taken to prevent exposure. They also need to know the proper method of decontaminating themselves and others.

Types of Exposure

The first thing to understand is how people become contaminated with a hazardous material. Contaminants can enter the body through the skin, mouth, and nose.

Dermal exposure occurs with materials that are capable of entering the blood or nervous system through the skin. *Ingestion exposure* occurs when the materials enter the body through the mouth and are absorbed through the digestive tract. Toxic material on food or on hands can be taken into the body orally. *Inhalation exposure* occurs when toxic materials are breathed into the lungs. Because of the physical condition of dust and liquids, it is extremely easy for firefighters to receive multiple exposures at the scene of a hazardous materials incident.

HazMat incidents frequently involve ruptured containers. The container may rupture because of fire or because of an accident that causes damage to the container, such as a derailment or an overturned tank truck or semi-trailer truck. Or the container may be destroyed by emergency service workers in the process of an overhaul operation. Whatever the cause, the primary problem is with dust and liquids. When these materials escape their original shipping containers, they become mixed with ash, debris, and water used in the firefighting operation. They become masked as normal byproducts of firefighting.

Preventive Measures

The best way to prevent contamination injuries is to keep firefighting personnel out of contact with materials that could cause toxic effects. Sounds obvious, doesn't it? Yet there are any number of case histories of individuals who were contaminated by toxic materials while performing overhaul at the scene of an emergency. They knew the material was scattered about, yet they disregarded the potential danger and proceeded to use traditional overhaul techniques.

If I were drafting a list of preventive measures to follow at a hazardous materials incident, they would include the following:

1. Never allow firefighters, law enforcement officers, or any other emergency personnel at the scene of a HazMat incident to walk unnecessarily in or through any spilled material even if they are wearing rubber boots and full protective gear issued to them in the interest of safety.



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2. Firefighting personnel responding to a HazMat incident, particularly one involving chemicals known to cause problems, should wear full protective clothing. This means rubber boots, full turnout pants and jacket, rubber vinyl gloves, SCBA, and helmet. You will note that this list specifically excludes leather gloves and boots. At a HazMat incident, leather can become part of the problem.

Leather is permeable. Toxic liquids or dusts suspended in water can penetrate leather gloves and boots and enter the body through the skin. Leather products exposed to toxic contaminants should be destroyed. Leather boots that have absorbed liquid pesticides, for example, continue to give off the chemical long after the leather has dried out from the initial contamination.

One more word of caution. Full protective clothing, as the term is normally used in the fire service, does not guarantee protection against gases such as methyl bromide and many of the fumigants that can be absorbed through the skin. Turnout gear provides only a temporary barrier against dermal exposure. Response guidelines may specify that firefighters should wear “specialized” protective clothing. This means acid suits made of chemically resistant materials that exclude not only dusts and liquids but vapors as well.

3. Personnel at a HazMat incident should keep as dry as possible. Contamination loves moisture. Once a toxic dust or liquid becomes mixed with water, its ability to permeate protective clothing is greatly increased. Firefighters on the initial attack crews who have been wet down or extensively exposed to the toxic material should be removed from the tire area and replaced with firefighters whose protective clothing is as dry as possible. It is far easier to decontaminate a firefighter in a dry uniform than it is a firefighter in a wet uniform.

Counteractive Measures

Sometimes contamination cannot be avoided no matter how careful you are. What then? As soon as it is realized that a firefighter has been contaminated, he should be removed immediately from the emergency site and isolated in an area established for the purpose of decontamination.

When emergency personnel begin to show signs of toxic poisoning, some incident commanders have them removed from the scene, put in an ambulance, and transported Code 3 to the nearest medical facility. All this does is needlessly expose the ambulance crew and emergency room personnel to the contamination. Even if it takes an extra 5 or 10 minutes to decontaminate victims at the scene of the emergency, it is time well spent. An incident commander faced with severe contamination problems should do everything in his power to leave the toxic material at the scene of the emergency.



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The decontamination area should be located away from the command post, staging areas, and resources pools. The decontamination area should be cordoned off and only those who have been contaminated should be allowed to enter, and only those who have been adequately decontaminated should be allowed to leave.

If possible, the decontamination area should be established downwind and downhill from the rest of the operation. In addition, the area should have a surface that will allow the contamination officer to control the runoff as individuals and tools are washed down. For example, a concrete pad or driveway is preferable to a graveled parking lot. If the contaminated individuals show no signs of needing medical care, the following decontamination procedures should be followed:

Contaminated individuals should not remove gear as they approach the decontamination area. All protective clothing, including SCBA and gloves, should be kept on.

Arbitrary hosing of contaminated individuals is not recommended. This may increase dermal exposure and cause runoff problems.

Spread a tarpaulin or large square of plastic sheeting on the ground. Contaminated individuals should step into the middle of the tarpaulin and remove the outer layers of clothing in a systematic fashion and place them on the sheet: first remove the SCBA tank, leaving the face piece on; remove the turnout coat, then the pants: then remove all remaining clothing that is soaking wet and place items on the pile, taking care to avoid unnecessary contact with the skin. For example, if the turnout coat is heavily contaminated, the firefighter should leave his gloves on to remove the coat, and then remove the gloves carefully to avoid contaminating the skin. If more than one firefighter is disrobing at the same time, they should be careful not to contaminate each other.

Once the victim's contaminated clothing has been removed—modesty should not prevent personnel from removing all clothing that has been exposed to the toxic substance—the patient should be wrapped in a clean sterile sheet for transportation to the medical facility. Common sense should be used, of course. If the weather is cold and the patient's work shirt and pants do not appear to be wet, they may be left on. If they are obviously contaminated, however, they should come off.

Strict control should be maintained over the isolation area. Ambulatory patients should be prohibited from leaving the area, even if they begin to "feel better." Personnel working in the area should be prohibited from smoking cigarettes, eating food, or drinking coffee. Styrofoam cups are particularly to be avoided.



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The incident commander, through the dispatch center, should advise the receiving hospital to institute its own security and decontamination procedures preparatory to receiving contaminated personnel needing medical attention.

Necessary Precautions

Your department's pre-emergency plans should take into account problems of contamination, and local hospitals should be advised that they, too, should establish security procedures to prevent contamination of their facilities. Basic precautions include having on hand a supply of large plastic garbage cans, plastic garbage can liners, and disposable plastic gloves. In addition, a written procedure should be developed for dealing with contaminated patients and distributed to all emergency room personnel.

Ambulances and other emergency vehicles used to transport contaminated victims should not be used for other purposes until thoroughly inspected to insure that no contamination has been transferred to the vehicle. If there is any question, the interior of the vehicle should be wiped down and the water and cleaning cloths used in the process should be placed in plastic containers and properly disposed of.

If individuals become contaminated at HazMat incidents, it is only reasonable to assume that tools and equipment used by them have also been contaminated. At the conclusion of the incident, all exposed tools and equipment should be taken to the decontamination area and cleaned. Again, lined plastic garbage cans make good vessels for cleaning tools, and the cleaning water can easily be disposed of safely.

The preservation of runoff is an important issue. It doesn't do much good to decontaminate one group of people and subsequently expose another group downstream. Every conceivable effort should be taken by firefighting personnel to keep runoff from leaving the decontamination area.

Techniques used in salvage and overhaul can be modified for use at the decontamination site. If hose streams are being used to wash off victims, salvage covers can be used to make catchalls. Or, a framework of ground ladders and pike poles strapped together and lined with a salvage cover can be used to develop a sump to hold runoff. Small retaining dams can also be fabricated out of dirt and earth materials found in the vicinity of the decontamination area. Sawdust and other absorbent material can also be used to prevent runoff from leaving the area.

Of course, as Benjamin Franklin said, "An ounce of prevention is worth a pound of cure." Decontamination activities are time consuming and create logistical problems that complicate the handling of the emergency. Firefighters must be impressed with the importance of avoiding contamination. They should do everything in their power to see that dust and liquids do not get on their



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clothing. Dermal and ingestion exposure can occur from 12 to 20 hours after the termination of an emergency. If exposed, firefighters should undergo decontamination as soon as possible, otherwise severe injury, even permanent disability, could result.

It is said that cleanliness is next to godliness. When it comes to HazMat incidents involving toxic materials, cleanliness is also next to safety and security.